



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/GB91/00169 (22) International Filing Date: 5 February 1991 (05.02.91) (30) Priority data: 9002510.7 5 February 1990 (05.02.90) GB (71)(72) Applicant and Inventor: ROWAN, Michael, Gray [GB/GB]; Main Castle, East Kilbride, Glasgow G74 4NR (GB). (74) Agents: McCALLUM, William, Potter et al.; Cruikshank &amp; Fairweather, 19 Royal Exchange Square, Glasgow G1 3AE (GB). (81) Designated States: AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB, GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.</p>		<p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: IMPROVED STILTS</p> <p>(57) Abstract</p> <p>A pair of stilts is described, said stilt of which has a resilient flexible foot (26, 78, 112) which can be hinged (26, 78) or integral (112) with the lower stilt leg portion (18, 74, 110). The resilient foot (26, 78, 112) deforms during walking and this enables the wearer to walk much better than with existing stilts. In a preferred embodiment the flexible foot (78) is hinged (87) to move laterally as well as back to front and this improves the stability of the stilt and facilitates running and sports. Further embodiments of the invention are described.</p> <div data-bbox="1023 1071 1331 1848"> </div>		

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IMPROVED STILTS

The present invention relates to stilts.

Stilts are well known and are structures designed to increase the height of an individual and to permit the individual to walk from one position to another at an elevated height. Stilts are generally worn by circus clowns and the like, but specialist stilts can be worn by tradesmen who have to work in areas of higher than average height and where it is otherwise difficult to instal platforms, ladders and the like.

The most common type of stilts consists of a pair of long poles each having an offset foot-support platform and, to use the stilts, the wearer grips the top of the poles with his hands and places his feet on the platforms, which extend inwardly from the poles when in use. A disadvantage of this arrangement is that the weight of the user does not act through the pole but, instead, acts in a path parallel to the direction of the pole with the result that there is an inward moment created at the top of the poles. This commonly results in a knock-kneed appearance of the stilt user and it is difficult for the user to walk with the stilts in such a position.

An improved type of stilt consists of a structure which has a foot support with an offset leg support although the weight of the foot acts directly through the bottom of the stilt. This overcomes the problems

associated with the offset foot support but a problem with this type of stilt is the inability of the user to ambulate properly. The user can generally only walk quite slowly and it is difficult if not impossible, for the wearer to run. Another problem with existing stilts is that because they have no resilience ground contact shocks pass directly to the wearer's ankles, knees and hips.

An object of the present invention is to provide an improved type of stilts which obviates or mitigates at least one of the disadvantages associated with the aforementioned type of stilts.

This is achieved by providing a pair of stilts where each stilt has a foot support portion with an upper leg portion arranged such that, in use, the weight of the user acts through the bottom of the stilt, and the bottom of each stilt has a flexible foot portion which is resiliently coupled to the stilt shaft.

With this arrangement the resilient foot deforms during walking to permit ease of gait in the manner similar to normal walking. It is also possible for the stilt wearer to run and to move much more easily than using stilts with rigid feet.

According to one aspect of the present invention, there is provided a pair of stilts characterised in that each stilt has a foot support portion coupled to an upper leg portion, and to a lower leg portion, each

lower leg portion having flexible foot means resiliently coupled to the bottom thereof whereby, in use, the weight of the wearer acts directly through the lower leg portion flexible foot means.

Preferably, each flexible foot means is pivotably mounted to its lower leg portion, the front and rear of said flexible foot being coupled to the lower leg portion by spring means.

Conveniently, the flexible foot means is pivotably about a front to rear axis and a side-to-side axis.

Preferably the flexible foot means is coupled to said lower leg portion by an axle which allows the stilt to move laterally relative to the flexible foot, means such that, in use, the sole said flexible foot means remains substantially in contact with the ground.

In one arrangement, this is provided by the flexible foot means having a pair of upstanding projections defining a front-to-back channel therein for receiving a projection extending from the bottom at the lower still member, each upstanding projection having a substantially vertical slot therein, and said projection having a substantially horizontal aperture therein to register with said slots, said axle being disposed in said slots and said aperture to couple said flexible foot means to said lower leg portion.

Alternatively, each lower leg member is made of a two-part plastic material which forms a rigid shaft

portion and a resilient flexible foot means which is integral with said rigid shaft portion, said resilient flexible foot means being deformable in late stance phase to store sufficient energy to give an active push at toe-off and to return the foot to its undeformed position during the swing phase of each stride so that, at heel strike, the stilt is ready to support the user through the next stance phase.

Preferably, each stilt consists of separate upper and lower leg members which are coupled together by coupling means at the lower end of the upper leg member and the upper end of the lower leg member.

Conveniently, that said upper leg member is located at the front of said stilt to act as a shin protector, and the upper end of said upper leg member has fastening means coupled thereto for fastening the stilt to the user's leg.

These and other aspects of the present invention will become apparent from the following description when taken in combination with the accompanying drawings in which:-

Fig. 1 is a side elevation of a person wearing stilts in accordance with an embodiment of the invention,

Fig. 2 depicts a side view of Fig. 1.

Fig. 3 depicts a stilt in accordance with a second embodiment of the invention;

Figs. 4 and 5 depict side and front views of a stilt in accordance with a third embodiment of the invention;

Figs. 6 and 7 depicts front and side views of a stilt member in accordance with a fourth embodiment of the present invention;

Fig. 8 is a side view of a stilt in accordance with a fifth embodiment of the invention;

Figs. 9 and 10 are side and front views of a stilt in accordance with a sixth embodiment of the invention;

Figs. 11 and 12 depict side and front views of a stilt in accordance with a seventh embodiment of the present invention, and

Fig. 11 is an enlarged view of Fig. 10 taken in the direction X showing how the top and bottom parts are slidably connected.

Reference is first made to Figs. 1 and 2 of the drawing which depicts a person wearing a pair of stilts 10 in accordance with an embodiment of the invention. The stilts consist of two separate stilt members 12 and 14 and only one will be described in detail although it will be appreciated that both are similar in structure. Each stilt 12 has a foot support platform 16 which is integral with a lower stilt member 18 and an offset upper stilt member 20. The upper stilt member 20 has a Velcro (trademark) strap 21 associated therewith to wrap round the calf of the user and secure the tilt to the

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leg. The lower stilt portion terminates in a narrow portion 22 which is pivotably coupled by a hinge 24 to afoot portion 26. The front and rear of the foot portion 26a, 26b respectively are coupled to the lower stilt member via strong resilient coil springs 28a and 28b.

In use, when the person wearing stilts wishes to walk he leans forward on one leg and the front spring 28a compresses and the person then lifts off this leg and during the swing phase of this leg the coil spring 28a extends the foot. On heel contact by rear portion 26b the rear spring 28b compresses to take up the load and the other foot flexes as at push-off. The other leg is affected in the same manner and this action is repeated during normal reciprocal gait. With this arrangement it will be appreciated that gait is more controlled and the springs absorb any jarring or shocks thus making the wearing of the stilts more comfortable and easy to manoeuvre. In addition, because the hinge acts as an ankle, the flexibility of the foot is somewhat similar to the natural human foot. Thus, ambulation is better and it is possible for the stilt wearer to be able to run with such stilts.

Reference is now made to Fig. 3 of the drawing which depicts a second embodiment of stilts generally similar to that shown in Fig. 1 and 2 except that the lower stilt member is integral with a resilient foot



30. The entire stilt member is moulded from a two-part plastic material which has a highly resilient foot portion which causes it to deform at toe-off and to extend during the stance phase so that at heel strike the foot is positioned to take up the load of the wearer and thus mimic the natural foot during normal gait.

The reference is now made to a third embodiment of the invention which is shown in Figs. 4 and 5 of the accompanying drawings. In this embodiment the upper stilts member 32 is aligned with the lower stilt member and the weight of the user acts through the lower stilt members 34. The upper and lower stilt members are integral and the upper stilt member acts as a shin protector and is coupled to a knee protector 36 which carries an adjustable leg strap 38 which can be fastened round the rear of the calf 39 as shown with Velcro (trademark) fasteners. The foot 40 rests in a foot support 42 which is adjustable to accommodate various sizes of feet and the cavity 44 defines a toe receiving portion which may include resilient inserts so that the foot is firmly wedged in the stilt.

The lower stilt member 34 is hinged to a lower foot portion 48 to allow the lower foot portion to flex relative to the lower stilt member 34. The front and rear of the foot has guards 50 to prevent the foot from catching on carpets or stairs and the like. Disposed between the lower foot portion and the lower portion of

the stilt 46 are resilient shock absorbing members 52 which may conveniently be made of a resilient polymer or a natural resilient rubber.

The stilts in this embodiment operate in a substantially identical manner to those described with reference to Figs. 1 to 3 in that at toe-off the front resilient portion 22 compresses to give an active push and during the swing phase the energy is released to expand the rubber portion thus forcing the foot to the unloaded condition so that at heel strike the foot is in a position ready to take the load for that particular stilt member. This is repeated alternately for each stilt during normal gait.

Reference is now made to Figs. 6 and 7 of the drawings which depict a fourth embodiment of the invention which is similar in many respects to the embodiment shown in Figs. 4 and 5. The upper stilt member 60 is a shin protector and the knee protector 62 consists of an outer foam shock absorber 64 and a height adjustable foam knee protector 66 (Fig. 6). The knee protector, and consequently the upper stilt member 60, is fastened to the wearer's leg at the popliteal fossa by an adjustable padded ski-type binding 68. The foot sits on platform 70 within a foot-cowl 71 and is secured therein by ski-type binding 72, which are also adjustable.

The lower stilt member 74 is coupled via a hinge

joint 76 to a sole 78 and by front and rear coil springs 80,82. The sole 78 has upstanding projections 84a,84b which have longitudinal slots 86a,b in which a hinge pin 87 in the form of a floating axle is located. As seen on Fig. 7 the lower end of the stilt member 74 has a projection 88 which fits between the projections 84a,84b and which also has an aperture 90 for receiving the floating axle 87. As seen in Fig. 7, a shock absorbing rubber pad 92 is also disposed between the top of the sole 78 and bottom of the projection 88 to cushion the wearer whilst walking or running. The bottom of the sole 78 has replaceable rubber tread 94 for grip and additional cushioning.

The stilt in this embodiment operates in a similar manner to that shown in Figs. 4 and 5 except that the floating axle 87 permits much greater flexibility of movement, especially lateral movement and this results in a significant improvement in stability. This is because when a lateral force or moment is applied to the foot, the slots 86a,86b permit the floating axle to tilt relative to the horizontal so that the bottom of sole 78 remains in contact with the ground to a much greater extent than with the other embodiments.

The slot and axle is shown centralised but could be slightly offset as long as the centre of gravity passes through so that when the user at rest, the stilts are stable.

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Reference is now made to Fig. 8 of the accompanying drawings which depicts a stilt of a pair of stilts in accordance with the fourth embodiment of the invention. In this case the stilt is somewhat similar to that shown in Fig. 1 with the upper stilt member 96 being integral and being offset from a flexible lower stilt member 98. The lower stilt member 98 is made of a polymer which has a tendency to mimic the natural resilience of the foot and obviates the need for a hinged foot with resilient springs or plastics. The material is sufficiently rigid to support the user but is also sufficiently resilient so as to allow the wearer to run. Different resiliences can be used to allow the wearer to participate in a variety of sports and the like. The stilt is secured to the leg via a Velcro strap 100 attached to the upper limb member and by a toe cover 102 and foot strap 104 on each of the stilt members.

Reference is now made to Figs. 9 and 10 of the accompanying drawings which depict the stilt member 106 which is similar overall to the member shown in Figs. 4 and 5 although the lower stilt member 110 is similar to the lower member shown in Fig. 6 of the accompanying drawings. The upper stilt member 108 is integral with the lower member and a knee protector 109 which is fastened behind the calf, as before, by means of a Velcro strap 111. Lower stilt member 110 has an integral resilient foot 112 and this embodiment combines

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the advantages of the embodiment shown in Figs. 4 and 5 and Fig. 8 so that the stilt has a variety of applications including sports. Moreover with this arrangement there is no requirement for a separate foot or assembly and the whole structure can almost be made in a single operation. However, the foot support can be made adjustable as with the embodiment of Figs. 4 and 5.

Reference is now made to Figs. 11 and 12 of the accompanying drawings which depicts a further embodiment of the invention. In this embodiment a stilt member generally indicated by reference 120 consists of a separate upper stilt member indicated by reference 122, which acts as a shin and knee protector, and a lower stilt member 124, which is integral with a flexible foot 126, and which is sufficiently resilient to both support the wearer and allow the stilt wearer to run. The upper and lower members are coupled by a slidable connection best seen in Fig. 13. It will be seen that the upper stilt member has guide rails 126 which are proportioned and dimensioned to define a channel 128 for receiving, in a sliding connection, a generally T-shaped top portion 130 of the lower stilt member 128. Once the sliding fit has been made, the upper and lower portions are secured therein by a conventional fastening means e.g. screw fasteners or by a cam over-centre mechanism which can lock the upper and lower members in place. It will be appreciated that an advantage of this

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arrangement is that the wearer can select different stilt members of different heights so as to give a different overall stilt height and can select different stilt members having different resiliences depending on the particular application. For example a particular resilient stilt member could be selected for sports applications with a less flexible more rigid member being selected for normal gait requirements. It will be appreciated that with these embodiments the stilts are superior to those of the prior art in that they permit the wearer to move easily and permit the user to jog or run. The stilts have application in many areas but particularly as a toy and in the entertainments industry. In addition, it is believed that the stilts may find application for use by tradesmen and the like, for example, fruit pickers, who have to wear stilts for jobs higher than average height but which are unsuitable for platforms and ladders or the like.

It will be appreciated that various modifications may be made to the embodiments hereinbefore described without departing from the scope of the invention, e.g. the stilts may be made in any suitable material which is sufficiently strong and provides appropriate load bearing capacity. This may also be wood or metal or a combination of these materials. In addition, the stilts may be made of moulded plastic. The coil springs in respect of the first embodiment may be replaced by any

other suitable resilient means e.g. resilient rubber pads. The foot connection shown in the embodiment of Figs. 6 and 7 may be used with the stilts of Figs. 1 to 5. The stilts may be moulded in a one piece with different plastics using a composite moulding technique so as to allow the lower foot portion to be moulded in a more resilient material. Alternatively it will be appreciated that the resilient foot may be coupled to the lower stilt member by means of screw threads or any other suitable fastener in accordance with fastening arrangements well known in the art.

Advantages of the invention are that the stilts improve the manoeuvrability of the wearer and thus improve the enjoyment of wearing stilts. In addition the stilts serve a useful function in that they improve gait which is desirable in the interests of safety. The stilts also permit the wearer to move more easily and to run. With the separate lower portion, stilts can be selected to suit specific applications; lower stilt members of different height and resilience can be selected depending on the particular requirements. It will be appreciated that the location of the wearer's foot can be adjustable both forward and sideways so as to minimise leg strain and the stilt foot is long enough to allow the user to stand still comfortably and is designed so as not to catch under carpets doors or the like which otherwise might trip the user. The springs,

resilient blocks and the resilient feet act as shock absorbers which make the stilts far more comfortable to wear than traditional stilts. The stilts may be mass produced in plastic leading to ease of manufacture and economy.



CLAIMS

1. A pair of stilts characterised in that each stilt has a foot support portion coupled to an upper leg portion, and to a lower leg portion, each lower leg portion having flexible foot means resiliently coupled to the bottom thereof whereby, in use, the weight of the wearer acts directly through the lower leg portion flexible foot means.
2. A pair of stilts as claimed in claim 1 characterised in that each flexible foot means is pivotably mounted to a its lower leg portion, the front and rear of said flexible foot being coupled to the lower leg portion by spring means.
3. A pair of stilts as claimed in claim 2 characterised in that said spring means is a coil spring.
4. A pair of stilts as claimed in claim 2 characterised in that said spring means is a member made of resilient polymer or rubber.
5. A pair of stilts as claimed in any preceding claim characterised in that the flexible foot means is pivotable about a front to rear axis and a side-to-side axis.
6. A pair of stilts as claimed in claim 5 characterised in that the flexible foot means is coupled to said lower leg portion by an axle which allows the stilt to move laterally relative to the flexible foot means, such that in use, the sole, the flexible foot

means of which remains substantially in contact with the ground.

7. A pair of stilts as claimed in claim 6 characterised in that the flexible foot means has a pair of upstanding projections defining a front-to-back channel therein for receiving a projection extending from the bottom of the lower still member, each upstanding projection having a substantially horizontal aperture therein to register with said slots, said axle being disposed in said slots and said aperture to couple said flexible foot means to said lower leg portion.

8. A pair of stilts as claimed in claim 7 characterised in that a resilient element is disposed between the bottom of said projection and the upper part of said flexible foot means.

9. A pair of stilts as claimed in claim 1 wherein each lower leg member is made of a two-part plastic material which forms a rigid shaft portion and a resilient flexible foot means which is integral with said rigid shaft portion, said resilient flexible foot means being deformable in late stance phase to store sufficient energy to give an active push at toe-off and to retain the foot to its undeformed position during the swing phase of each stride so that, at heel strike, the stilt is ready to support the user through the next stance phase.

10. A pair of stilts as claimed in any preceding claim

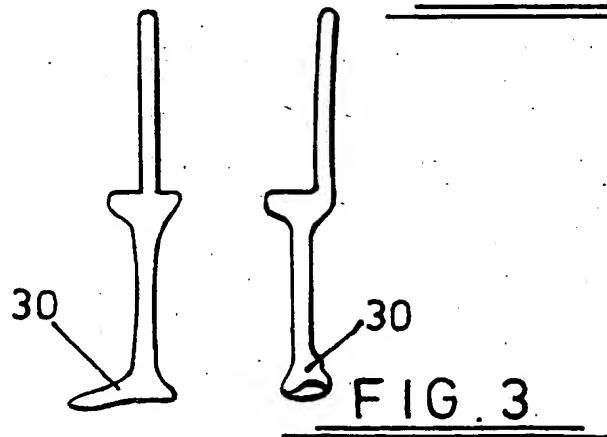
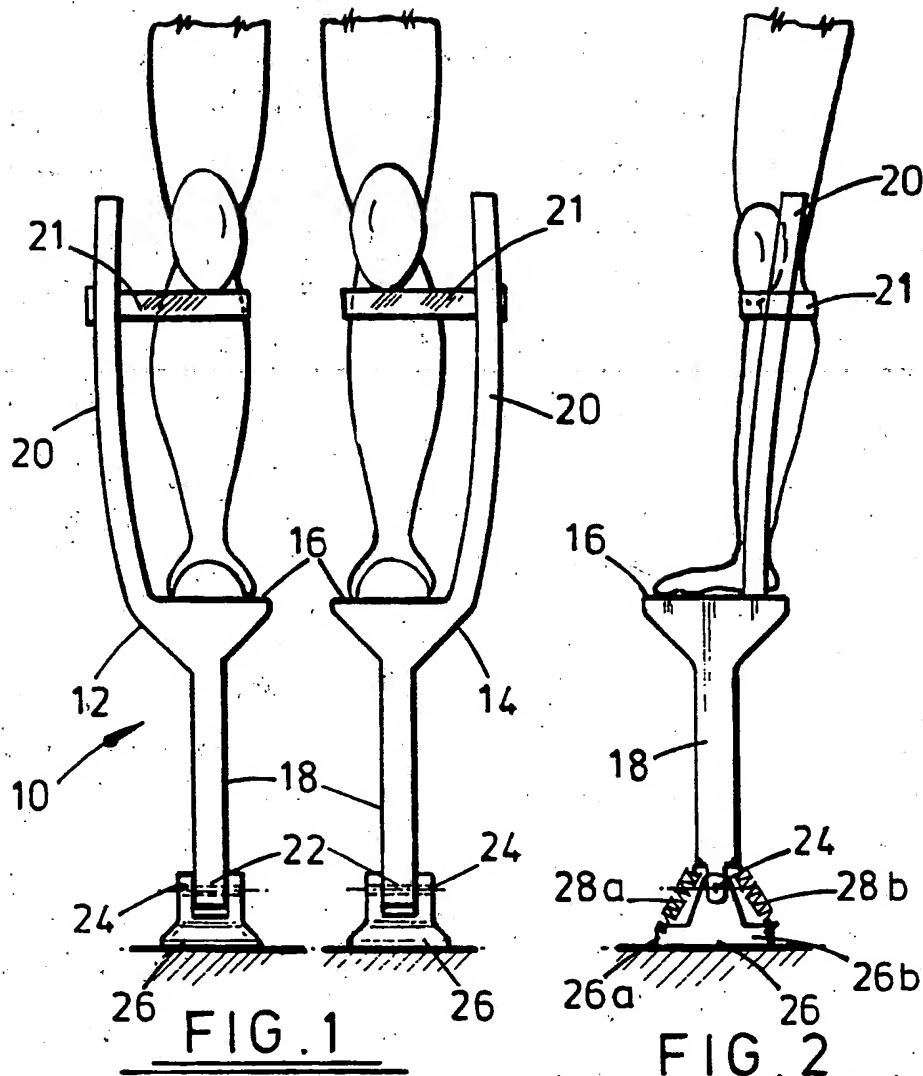
characterised in that each consists of separate upper and lower leg members which are coupled together by coupling means at the lower end of the upper leg member and the upper end of the lower leg member.

11. A pair of stilts as claimed in claim 10 characterised in that the coupling means is a sliding connection provided by a generally C-shaped channel at the bottom of the upper leg member and a generally T-shaped portion at the top of the lower member

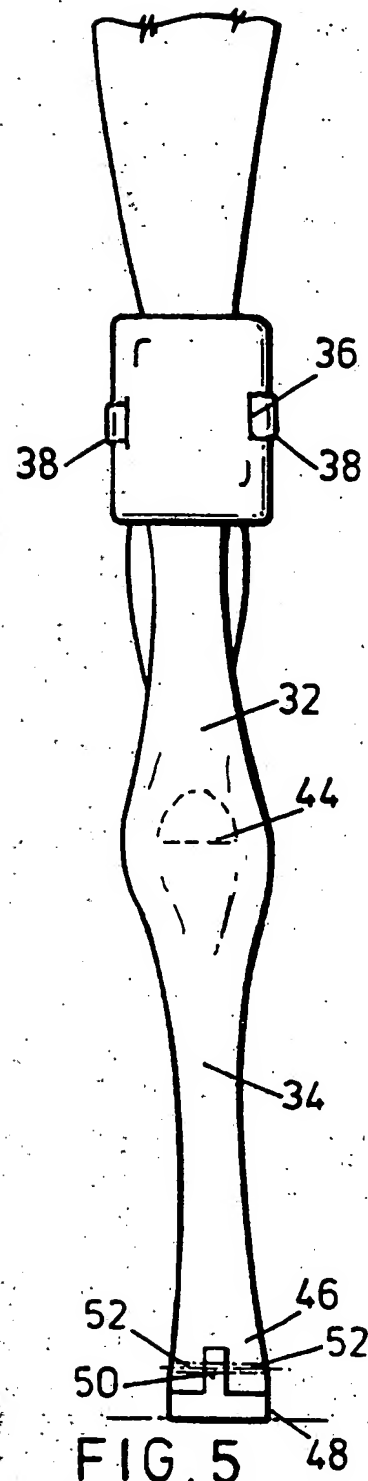
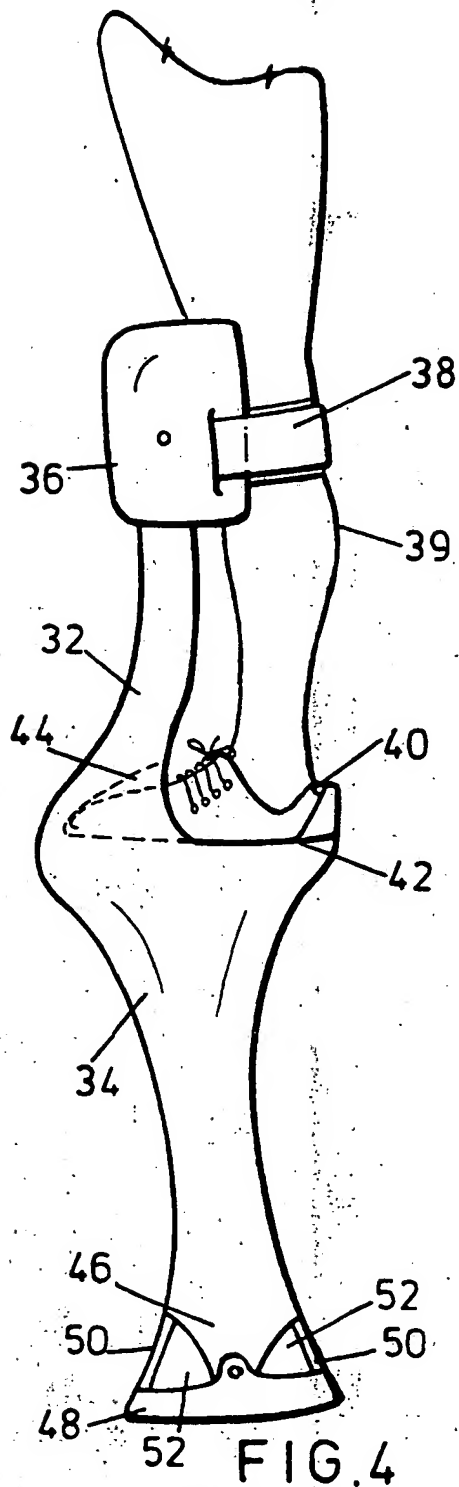
12. A pair of stilts as claimed in any preceding claim characterised in that said upper leg member is located at the front of said stilt to act as a shin protector, and the upper end of said upper leg member has fastening means coupled thereto for fastening the stilt to the user's leg.

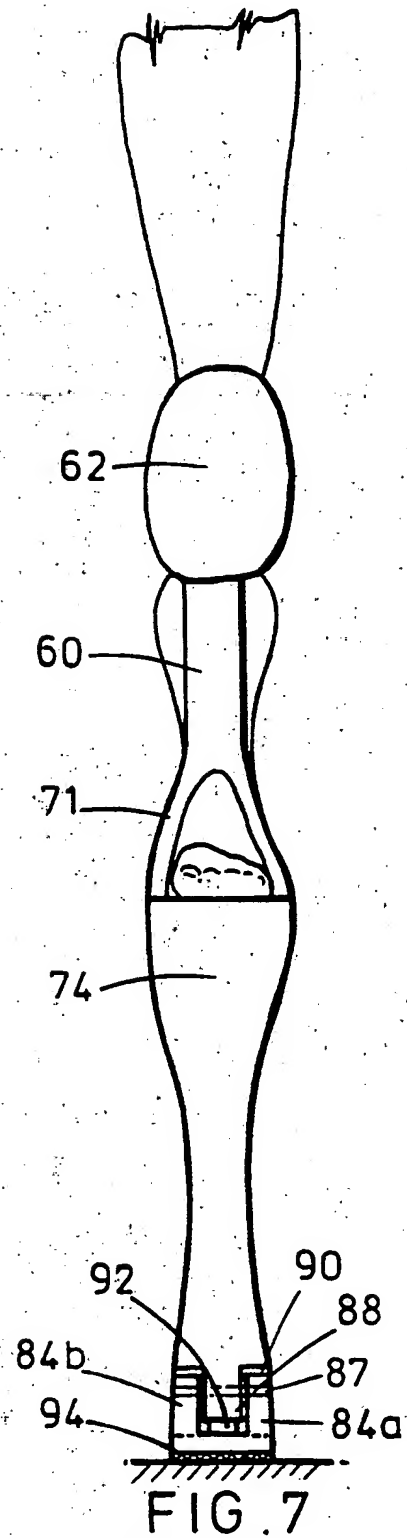
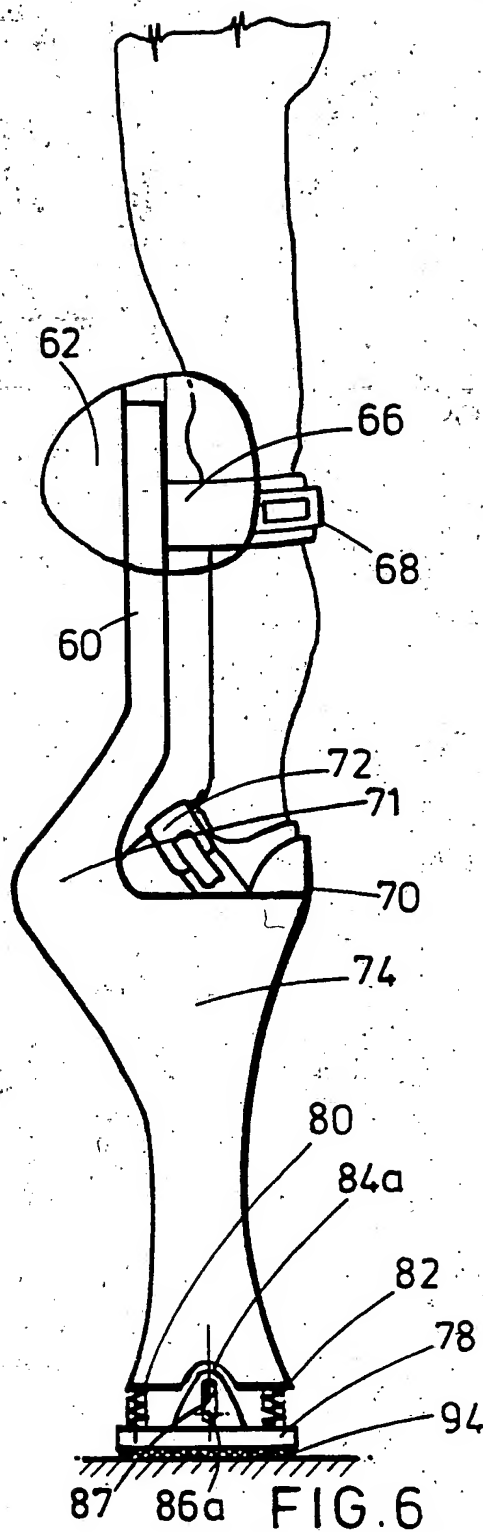
13. A pair of stilts as claimed in claim 12 characterised in that a knee protector is located at the top of said upper leg member, said knee protector having said fastening means.

14. A stilt as claimed in any preceding claim wherein said foot support means is adjustable in size to accommodate various sizes of feet, and said foot support means has foot securing means for securely fastening the stilt to the user's foot.

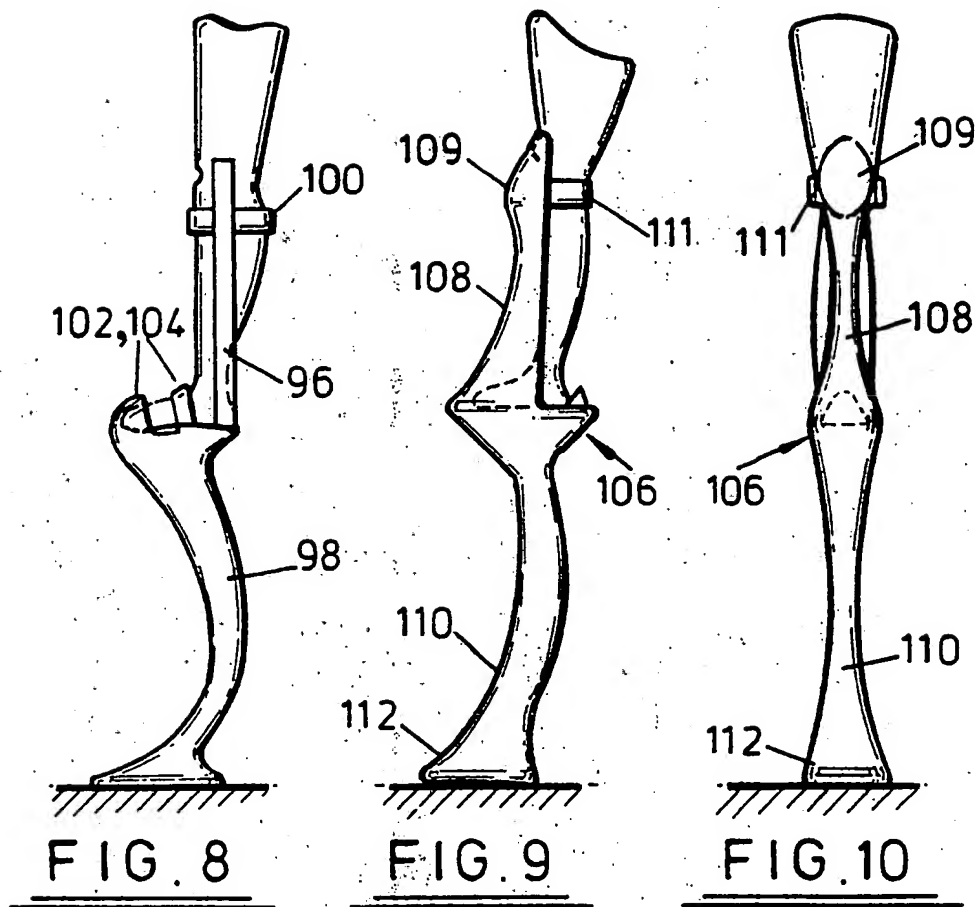


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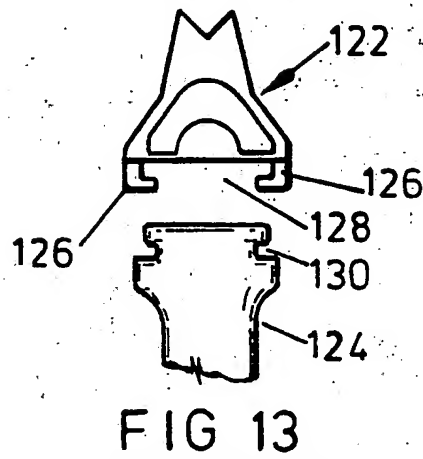
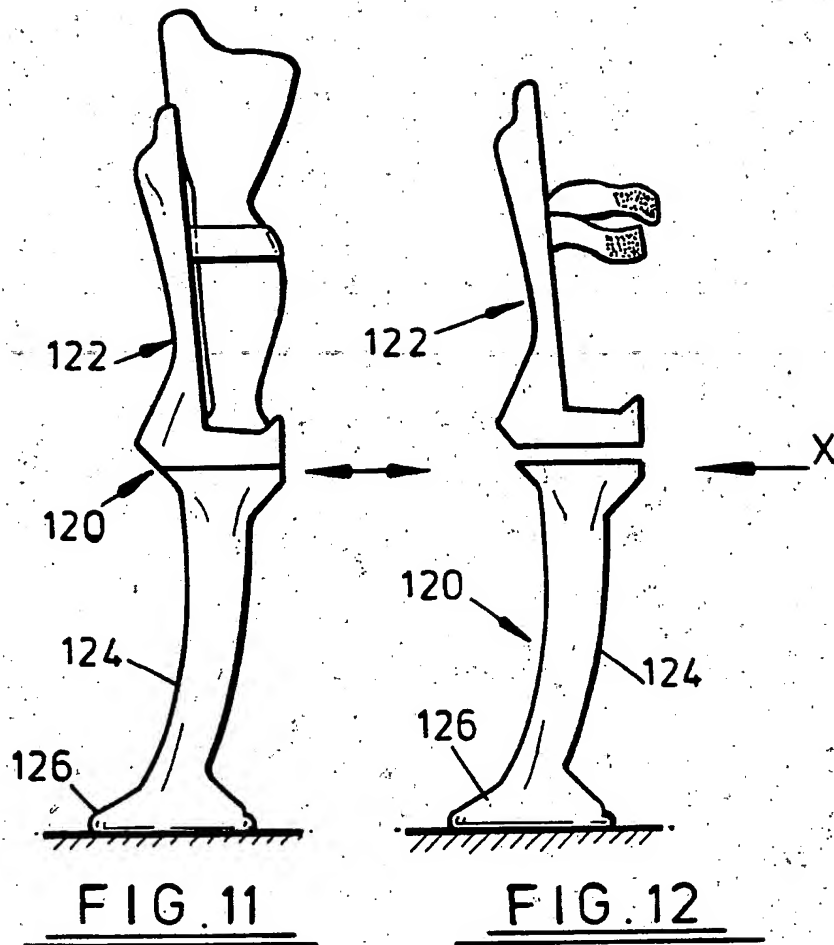




SUBSTITUTE SHEET



**SUBSTITUTE SHEET**





# INTERNATIONAL SEARCH REPORT

International Application No. PCT/GB 91/00169

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: A 63 B 25/00</b>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	A 63 B	
Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in Fields Searched <sup>8</sup>		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category <sup>10</sup>	Citation of Document <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	US, A, 2853493 (R.P. SKAGGS ET AL) 20 May 1958, see the whole document	1-3
Y	--	5-7
Y	DE, C, 447958 (D. STIER) 30 July 1927, see the whole document	5-7
P	US, A, 4927137 (C.R. SPEER) 22 May 1990, Figure 1 and text in column 2 and column 3	1-3, 14
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>* Special categories of cited documents:</b><sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 45%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"Z" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
12th April 1991	19. 06. 91	
International Searching Authority	Signature of Authorized Officer	
EUROPEAN PATENT OFFICE	<span style="float: right;">Danielle van der Haas</span>	

ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/GB 91/00169

SA 44585

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the European Patent Office EDP file on 23/03/91  
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 2853493	20/05/58	NONE	
DE-C- 447958	30/07/27	NONE	
US-A- 4927137	22/05/90	NONE	

For more details about this annex : see Official Journal of the European patent office, No. 12/82